UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua
Sidang 1985/86

REW 224 - Perkhidmatan Kejuruteraan Bangunan dan Infrastruktur Fizikal I

Tarikh: 7 April 1986 Masa: 2.15 ptg. - 5.15 ptg.
(3 jam)

Sila pastikan bahawa kertas peperiksaan ini mengandungi EMPAT muka surat dan TUJUH muka surat Lampiran yang tercetak sebelum anda memulakan peperiksaan ini.

Jawab LIMA soalan.

1. (a) Apakah sistem-sistem pendingin hawa yang utama di bangunan perdagangan tempatan? Nyatakan tertib aktiviti-aktiviti dalam rekabentuk suatu sistem pendingin hawa untuk bangunan-bangunan.

(b) Dengan suatu gambarajah tunjukkan sistem pendingin hawa untuk Pejabat Dekan, Pusat Pengajian Universiti dan bilik setiausahanya bersambungan.

(20 markah)

2. (a) Nyatakan objektif Kerajaan Malaysia yang utama dalam Rancangan Bekalan Letrik Luar Bandar di bawah Rancangan Malaysia Kelima. Apakah aspek-aspek perancangan yang berhubung dengan Rancangan ini?

...2/-

(b) Hitungkan sumbangan-sumbangan pihak-pihak pemborong untuk pembekalan letrik kepada satu sekim perumahan luar bandar dibawah Rancangan Bekalan Letrik Luar Bandar dengan maklumat-maklumat berikut:-

Jumlah harga sekim letrik	M$110,000.00
Bilangan keluarga	190
Kegunaan kuasa letrik sebuah keluarga (dianggar)	17 unit sebulan
Kos kuasa letrik LLN	26¢ seunit
Kos pengeluaran kuasa letrik LLN	8¢ seunit
Mengira bayar balik untuk LLN atas Sekim-Sekim Rancangan Bekalan Letrik Luar Bandar	13.5% setahun

(20 markah)

3. (a) Berkaitan dengan Akta Kilang dan Jentera 1967 terangkan <u>TIGA</u> dari istilah-istilah berikut:-

(i) "Dumbwaiter"
(ii) Lif barang-barang
(iii) Lataran
(iv) Pintu-buka tengah

(b) **Apakah peraturan-peraturan yang ditentukan untuk membentukkan suatu lubang lif mengikut Akta Kilang dan Jentera 1967?**

(20 markah)

4. Sediakan satu sistem pencahayaan dengan menggunakan cara "Lumen" untuk suatu bilik jahitan di Kilang Baju, lima tingkat, 40' x 35' x 15' tingginya. Gunakan alat lampu kelimantang AEG "strip lighting" dan penentuan-penentuan berikut:-

(a) Pemasangan alat-alatan digantung 5' dari siling.

(b) Sata kerja 3' dari lantai.

(c) Tiub kelimantang 4' panjang dan warna "Natural".

(d) Faktor Senggaraan 70%.

Dengan menggunakan satu pelan kadar kasar, tunjukkan susunan alat-alat dalam bilik jahitan tersebut.

(Jadual Pencahayaan Biasa Perkelas "Tugasmata". Faktor-Faktor Pengunaan Sekim Pencahayaan, dan Ciri-Ciri Lampu dilampirkan).

(20 markah)

...4/-

5. Mengikut Bahagian 6, Keperluan Api, Undang-Undang Kecil Perbandaran Kuala Lumpur (Bangunan) 1975, huraikan sistem pemadam api, sistem amaran api dan pencahayaan unit kawalan keluar bagi bilik jahitan di kilang baju dalam Soalan 4(b) .

Dengan menggunakan lakaran tunjukkan sistem-sistem pemadam api yang diperlu.

(Undang-Undang Kecil, Bahagian 6, Jadual 14 dikepilkan).

(20 markah)

6. Dengan lakaran-lakaran berlebel, huraikan sistem ganti udara otomatik untuk kilang baju dalam Soalan 4(b). Nyatakan faedah-faedah sistem tersebut.

(20 markah)

7. Berikan nota-nota ringkas berkenaan dengan perkara-perkara di bawah:-

(a) Insuran dan kebakaran.

(b) Kajian yang tepat bagi komponen penyejuk untuk beban pendingin hawa dalam bangunan-bangunan.

(c) Zon selesa.

(20 markah)

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Lampiran

Lighting Level Per Eye-Tasks (REW 224)

Indoor Lighting (Dwellings)

1. Living Rooms

General	-	15 lm/ft2
Locally - Reading, Writing	-	50-100 lm/ft2

2. Kitchens

General	-	15 lm/ft2
Locally - Store	-	25-50 lm/ft2

3. Bedrooms

General	-	15 lm/ft2
Locally - Mirrors, Dressing Tables	-	25-50 lm/ft2

4. Hallways, Stairways, Garage

General	-	15 lm/ft2
Locally - Work Bench Tables	-	25-50 lm/ft2

Schools

Classrooms, Science Rooms, Workshops	25-50 lm/ft2
Gymnasium, Assembly Hall	15 lm/ft2

Factories

Offices	25-50 lm/ft2
Assembly Halls	50-100 lm/ft2
Finish & Inspection	100-200 lm/ft2
Sewing & Trimming	200 lm/ft2
Storage	15 lm/ft2

Hospitals

Doctor's Rooms

General	15 lm/ft2
Work Table	50-100 lm/ft2

Laboratories

Research Rooms	25-50 lm/ft2
Work Tables	50-100 lm/ft2

Dispensary

General, Store Room	15
Dispensing Table	50-100

Surgical Department

Operating Theatre General	50-100 lm/ft2
Operating Table	2000-4000 lm/ft2
Sterilizing Room	50-100 lm/ft2

Bathrooms

General	15
Mirrors	25-50

X-Ray Department

(adjustable)	0-15 lm/ft2

First Aid Department

General	- 50-100
Locally	- 1000-2000
Corridors	- 15
Kitchens	- 25-50

Maternity Department

Delivery bed	- 500-1m/ft2
Delivery Room- General	- 25-50 lm/ft2
Nursery	- 15 lm/ft2

Offices

Manager's Rooms - 25-50 lm/ft2
Conference Rooms - 25-50 lm/ft2
Designing Rooms,
Machine engrg.
and architecture-100-200 lm/ft2
Decorative dressing
rooms - 50-100 lm/ft2
Typing - 50-100 lm/ft2
Clerical jobs - 25-50 lm/ft2
Book-keeping)
Records) - 50-100 lm/ft2
Accounts)

Patients Rooms

General	- 15 lm/ft2
Bedlighting	- 25-50 lm/ft2

Hotels and Restaurents

Bedrooms	
General	- 15 lm/ft2
Bedlighting)	
Dressing table)	- 25-50 lm/ft2
Writing Desk)	
Lounge)	
Restaurent)	
Bar)	- 15 lm/ft2
Hallways)	
Stairways)	

-ooooOooo--

Lampiran

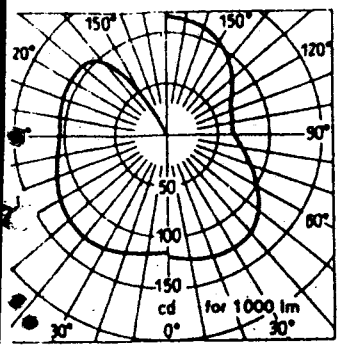


Fig. 19/18. Single-tube fluorescent-lamp fitting, 20 to 120 W, eff. 92%

Light distribution curve

left: 1 lamp, mainly direct

right: 2 lamps, direct

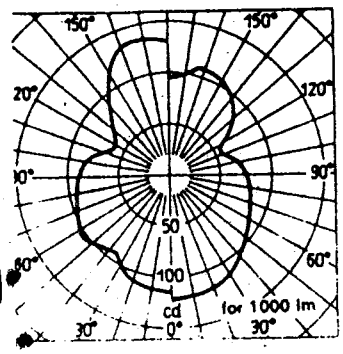


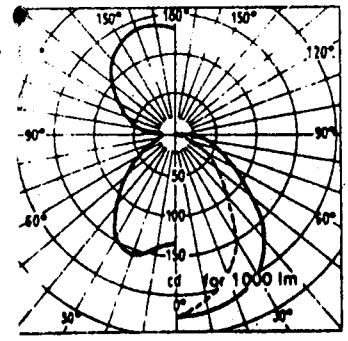
Fig. 19/19. Twin-tube fluorescent-lamp fitting with glass louvre, 40 to 120 W, eff. 84%, lamps arranged side by side

Light distribution curve

left: 2 lamps

right: 3 lamps

Uniform upward and downward radiation



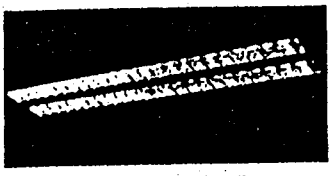


Fig. 19/20a. Rectangular fluorescent-lamp fitting with metal louvre, 40 to 120 W

Light distribution curve

left: Pendant lamp, upw. and downw. radiation, eff. 84%

right: Ceiling-mounted, downward radiation, eff. 55%

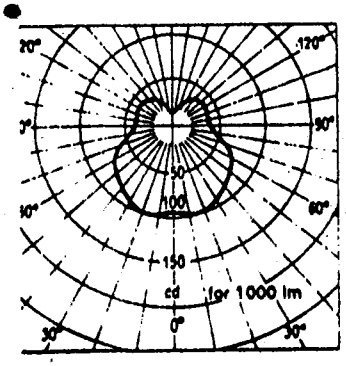


Fig. 19/20b. Ceiling fixture with acrylic trough for 20 to 65 W fluorescent lamps, eff. 60%
Light distribution curve mainly direct

Table 19/11. Utilization factors of lighting schemes

Room index *k*	Reflection factor Ceiling 70%	Wall 50%	Ceiling 50%	Wall 50%	Ceiling 30%	Wall 10%
AEG reflector fittings, direct narrow angle, Fig. 19/15 (efficiency 80%), for h.p.m.v., mixed-light and incandescent lamps						
5	0.72		0.68		0.65	
3	0.66		0.65		0.61	
2	0.59		0.61		0.55	
1.25	0.52		0.53		0.48	
0.8	0.42		0.44		0.40	
AEG strip lighting fittings, mainly with direct free radiation, Fig. 19/18 (efficiency 92%)						
5	0.65		0.58		0.50	
3	0.59		0.52		0.44	
2	0.52		0.50		0.40	
1.25	0.44		0.41		0.32	
0.8	0.36		0.32		0.25	
AEG lighting fittings with uniform upward and downward distribution, glass louvre, Fig. 19/19 (efficiency 84%)						
5	0.60		0.53		0.45	
3	0.54		0.48		0.40	
2	0.48		0.45		0.38	
1.25	0.40		0.38		0.29	
0.8	0.32		0.29		0.23	
AEG strip lighting fittings with metal louvre, uniform upward and downward distribution, Fig. 19/20a (efficiency 70%)						
5	0.50		0.44		0.38	
3	0.45		0.40		0.34	
2	0.40		0.38		0.30	
1.25	0.34		0.32		0.25	
0.8	0.27		0.26		0.19	
AEG Acrylic-trough ceiling fittings, mainly direct radiation, Fig. 19/20b (efficiency 60%)						
5	0.46		0.44		0.40	
3	0.42		0.41		0.36	
2	0.38		0.38		0.32	
1.25	0.33		0.32		0.27	
0.8	0.26		0.26		0.21	

Direct illumination through louvres

Room index	Matt-white louvre	Glossy-white louvre	
5	0.30	0.40	An even illumination requires a distance between light source and louvre equal to two-thirds of the distance between two lamps.
2	0.25	0.35	
0.8	0.20	0.25	

LAMP CHARACTERISTICS

Fluorescent Lamp Colour Designation and Lighting Design Lumens

(240v. Rated Life 3000 hours)

Rating (Watts)	White	Warm White	Daylight	Natural	Deluxe Warm White	Kolorite	Northlight Colour Machining	Deluxe Natural	Artificial Daylight
15 diam. 25 mm	800	800	750	600	-	-	500	450	400
15 diam. 38 mm	750	750	700	550	500	-	450	400	-
20 diam. 38 mm	1100	1100	1050	800	750	750	700	600	500
40L. 600 mm (2')	1700	1700	1600	1300	1200	1100	1050	900	1200
40L. 1200 mm (4')	2750	2750	2650	2100	1950	1800	1700	1500	-
80L. 1200 mm (4')	5200	5100	4950	3900	3500	3400	3100	2700	2300
85L. 1800 mm (6')	6300	6100	5750	4350	-	3850	3690	3200	2600
85L. 240 mm (8')	6800	6700	6500	5000	4700	4400	4100	3800	3000

Incandescent Filament Lamps (Pear Shaped 240v. Rated Life 1000 Hours)

Rating (Watts)	Lighting Design Lumens	Class	Bulb Finish
25	200	Single Coil	Internally frosted
40	390)		
60	665)		
100	1260)	Coiled Coil	- do -
150	2040)		
200	2720)		
500	7700)	Single Coil	Clear
1000	17300)		

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P.U. (A) 180.

FOURTEENTH SCHEDULE

TABLE OF REQUIREMENTS FOR FIRE EXTINGUISHMENT SYSTEM, ALARM SYSTEMS AND ILLUMINATION OF MEANS OF EGRESS

	Occupancy Hazard	Extinguishing System Note 2	Fire Alarm System Note 3	Illumination of Means of Egress Control Unit	
				Voltage	Lamp Wattage
1.	PLACES OF ASSEMBLY				
1.1	Class A and B below the level of exit discharge	A and G	2	normal	25
1.2	Stage with fly galleries gridirons and riggings for moveable theatre-type scenery	A and G	2	normal	25
1.3	Hazardous Areas	A, B, C, D, E or F	—	—	—
2.	UNDERGROUND STRUCTURES AND WINDOWLESS BUILDINGS	G and H	1 and 2	—	—
3.	EDUCATIONAL OCCUPANCIES	G	4	normal	40
4.	INDUSTRIAL BUILDINGS				
4.1	Single storey exceeding 7,500 sq. ft.	G and H	2	—	—
4.2	Two storeys where the first floor exceeds 5,000 sq. ft	G and H	2	normal	40
4.3	More than two storeys or exceeding 250,000 cubic feet	A and G	2	—	—
4.4	Hazardous processes or storage	A, B, C, D, E or F	2	—	—
5.	MERCANTILE OCCUPANCIES				
5.1	Class A and B	A and G	2 and 3	normal	40
5.2	Combined Mercantile and Hotel Occupancies	A and G	2 and 3	24	25
5.3	Mercantile Occupancies below Hotel Occupancies	A and G	2 and 3	normal	40
5.4	Shopping malls	A and G	2	normal	40
6.	OFFICES AND BANKS EXCEEDING 60 FEET IN HEIGHT OR 100,000 SQUARE FEET GROSS AREA	G	1 and 2	24	8 flourescent
7.	HOSPITAL OVER 4 STOREYS	—	—	—	—
7.1	Hospitals and Nursing Homes	G and H	1, 2 and 3	normal	40
7.2	Residential and/or Custodial Care	G and H	1, 2 and 3	24	8 flourescent
8.	HOTELS				
8.1	Hotels exceeding 50 rooms—				
	rooms and general area	G	1, 2 and 3	24	25
	public areas	A and G	2 and 3	normal	25
8.2	Hotels exceeding 60 feet in height	A and G	2 and 3	24	25

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	Occupancy Hazard	Extinguishing System Note 2	Fire Alarm System Note 3	Illumination of Means of Egress Control Unit	
				Voltage	Lamp Wattage
8.3	Hotels above Mercantile or Office Occupancies	G	1	normal	40
9.	Multi-Storey Flats Exceeding 60 Feet in Height Other than Balcony-Approach Type	—	—	24	8 flourescent
10.	Storage Areas				
10.1	Basements and underground garages	G	2	—	—
10.2	Basement garages and carparks exceeding 5,000 square feet	A and G	2	normal	40
10.3	Multi-storeyed carparks ..	G and H	2	normal	40
10.4	Automated Warehouses and high stack warehouses	A, B, C or F	2	—	—
10.5	Godowns and Warehouses over 2 storeys in height	A, C or F	2	normal	40
10.6	Basements in non-residential buildings (except strong rooms, safe deposits of banks) exceeding 5,000 sq. ft.	A or C	2	—	—
11.	Laboratories	D, E or F	1 and 2	normal	40
12.	Computors and Electronic Equipment Susceptible to Damage by Fire, Heat or Smoke	E	1	—	—
13.	Air Conditioning Systems (Return Air Duct, Lift Shafts, Service Shafts, Linen Chutes)			—	—
	For buildings exceeding 60 feet	A	1	—	—

Note 1. The hazardous areas and processes within any building are the following areas—

(*a*) Boiler Room and Associated Fuel Storage spaces.

(*b*) Laundries.

(*c*) Repair Shops.

(*d*) Room or spaces used for storage in quantities materials deemed hazardous.

(*e*) Kitchen.

(*f*) Soiled Linen Room.

(*g*) Transformers and sub-stations.

(*h*) Plant Room.

(*i*) Flammable liquid processing or refining operations.

(*j*) Indoor Storage of flammable liquids.

(*k*) Chemical plants, solvent extraction plants, distillation plants, refineries.

(*l*) Process equipment, pump rooms, open tanks, diptanks, mixing tanks.

NOTE 2. The letters in the second column of this Appendix refer to the types of fixed extinguishing system, as follows—

A—Automatic Sprinklers.

B—Water spray system.

C—High Expansion Foam System.

D—Carbon-dioxide system.

E—Approved Halogenated Extinguishing System.

F—Other Automatic Extinguishing System.

G—Hose Reel.

H—Hydrant System.

NOTE 3. The figures in the third column of this Appendix refer to the types of fire alarm, as follows—

1—Automatic Fire Detectors System.

2—Manual Electrical Fire Alarm System.

3—Signal Indicator Alarm System.

4—Manual Alarm System.

NOTE 4. Types of Emergency Illumination—

(*a*) Signal point units.

(*b*) Central Battery.

(*c*) Generators.

In all cases the duration of emergency illumination in the event of failure of normal supply shall not be less than 1 hour.

FIFTEENTH SCHEDULE

STANDARD SCALE FOR MAINS WATER SUPPLY FOR INSTALLATION OF FIRE HYDRANTS

ALL NEW AND RESITED FIRE HYDRANTS SHALL BE DOUBLE-FILLER STAND POST TYPE

Risk Category	Average Output per Fire Hydrant	Spacing of Fire Hydrants	Total number of Fire Hydrants in area of risk likely to be employed simultaneously in major fires
Class A	300/400 gpm	300 feet	4—6
Class B	250/300 gpm	400 feet	3—5
Class C	250/300 gpm	450 feet	3—4
Class D	180/220 gpm	450 feet	1—2
Class E	180/220 gpm	600 feet	1
Special High Risk ..	300/400 gpm	300 feet Max	6

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